

Rec'd PCT 18 APR 2005

## PATENT COOPERATION TREATY

**PCT****INTERNATIONAL PRELIMINARY EXAMINATION REPORT**  
(PCT Article 36 and Rule 70)

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| Applicant's or agent's file reference<br>P56404PC00  | <b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416) |  |
| International application No.<br>PCT/NL 03/00705   | International filing date (day/month/year)<br>17.10.2003  | Priority date (day/month/year)<br>18.10.2002 |
| International Patent Classification (IPC) or both national classification and IPC<br>B01J23/78 |   |  |
| Applicant<br>ENGELHARD CORPORATION et al.  |   |  |

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 8 sheets, including this cover sheet.
- This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).
- These annexes consist of a total of sheets.
3. This report contains indications relating to the following items:
- I  Basis of the opinion
  - II  Priority
  - III  Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
  - IV  Lack of unity of invention
  - V  Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
  - VI  Certain documents cited
  - VII  Certain defects in the international application
  - VIII  Certain observations on the international application

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|--|---|
| Date of submission of the demand<br>17.05.2004   | Date of completion of this report<br>27.01.2005                           |
| Name and mailing address of the international preliminary examining authority:<br><br><br>European Patent Office<br>D-80298 Munich<br>Tel. +49 89 2399 - 0 Tx: 523656 epmu d<br>Fax: +49 89 2399 - 4465 | Authorized Officer<br><br>Besselmann, S<br>Telephone No. +49 89 2399-8401 |



**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/NL 03/00705

**I. Basis of the report**

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

**Description, Pages**

1-16 as originally filed

**Claims, Numbers**

1-26 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- the language of publication of the international application (under Rule 48.3(b)).
- the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- contained in the international application in written form.
- filed together with the international application in computer readable form.
- furnished subsequently to this Authority in written form.
- furnished subsequently to this Authority in computer readable form.
- The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- the description, pages:
- the claims, Nos.:
- the drawings, sheets:

5.  This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

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**IV. Lack of unity of invention**

1. In response to the invitation to restrict or pay additional fees, the applicant has:
  - restricted the claims.
  - paid additional fees.
  - paid additional fees under protest.
  - neither restricted nor paid additional fees.
2.  This Authority found that the requirement of unity of invention is not complied with and chose, according to Rule 68.1, not to invite the applicant to restrict or pay additional fees.
3. This Authority considers that the requirement of unity of invention in accordance with Rules 13.1, 13.2 and 13.3 is
  - complied with.
  - not complied with for the following reasons:  
**see separate sheet**
4. Consequently, the following parts of the international application were the subject of international preliminary examination in establishing this report:
  - all parts.
  - the parts relating to claims Nos. 2, 3-20,26 (when referring back to claim 2) .

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**1. Statement**

|                               |      |        |         |
|-------------------------------|------|--------|---------|
| Novelty (N)                   | Yes: | Claims | -       |
|                               | No:  | Claims | 2-20,26 |
| Inventive step (IS)           | Yes: | Claims | -       |
|                               | No:  | Claims | 2-20,26 |
| Industrial applicability (IA) | Yes: | Claims | 2-20,26 |
|                               | No:  | Claims | -       |

**2. Citations and explanations**

**see separate sheet**

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**Re Item IV**

**Lack of unity of invention**

1. The IPEA has identified the following 3 inventions or groups of inventions:

Invention 1: claims 1, 3-20, 26 when referring to claim 1  
A catalyst,  
a matrix particle comprising the catalyst,  
a slurry comprising the catalyst,  
a method for preparing the catalyst,  
a catalyst precursor  
a process using the catalyst or matrix particle or slurry and the use of the catalyst.

Invention 2: claims 2, 3-20, 26 when referring to claim 2  
A catalyst,  
a matrix particle comprising the catalyst,  
a slurry comprising the catalyst,  
a method for preparing the catalyst,  
a catalyst precursor  
a process using the catalyst or matrix particle or slurry and the use of the catalyst.

Invention 3: claims 21-25  
A process for hydrogenating an unsaturated fatty substance

2. The separate inventions or groups of inventions are not so linked as to form a single general inventive concept for the following reasons:

- 2.1 A catalyst comprising nickel, silica, alumina and magnesium wherein the atomic ratios fall within the ranges defined in claim 1 are already known from EP-1 101 530 A (example 3).

The additional feature of claim 1 is the particle size. Neither this feature nor any

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corresponding technical feature is present in claim 2. Similar considerations apply to the additional feature of claim 2 (i.e. the presence of a protective layer).

- 2.2 Claim 21 defines a process using the catalyst. In the present case of claims belonging to different categories, only the product may constitute a common link. However, the catalyst referred to in claim 21 is already known from EP-1 101 530 A (example 3).

With the catalyst being not novel, process claim 21 and claims 1 and 2 are not so linked as to form a common general inventive concept.

There is consequently no technical relationship between the subject-matter of these claims, and the requirement for unity of invention referred to in Rule 13.1 PCT is *a posteriori* not fulfilled in view of EP-1 101 530 A.

3. Following the invitation to restrict or to pay additional fees, the applicant requested that invention 2 (i.e. claims 2, 3-20, 26 when referring to claim 2) be subject of the preliminary examination.

**Re Item V**

**Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Reference is made to the following documents:

- D1: EP-A-1101530
- D2: US-A-4532351
- D3: US-A-4631265
- D4: US-A-5616531
- D5: EP-A-0597662
- D6: WO-A-9530481
- D7: DE-A-2850719

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**2. DOCUMENT D1 - NOVELTY (Art. 33(2) PCT)**

- 2.1 D1 (example 3) discloses a catalyst comprising Ni (60 wt%), Mg (2 wt%), SiO<sub>2</sub> (18 wt%) and Al<sub>2</sub>O<sub>3</sub> (3 wt%). The catalyst of D1 contains iron as an essential component. However, there is nothing in the present claims which would exclude the presence of iron.

According to the general teaching, the catalyst may be passivated (paragraph 16). A passivated catalyst may be regarded as a catalyst coated with a protective layer which prevents (further) oxidation. This understanding of the term "protective layer" is in accordance with the present application (e.g. page 5, line 7).

The subject-matter of independent claim 2 is therefore not novel.

- 2.2 The catalyst of D1 is used in a slurry (paragraph [0020]). During use in the reaction medium, the catalyst may be regarded as "incorporated in a protective material" within the broad meaning of the term.

D1 also discloses a method for preparing the catalyst using co-precipitation from a solution of salts of the catalyst components, filtration and activation with hydrogen (example 3).

The subject-matter of claims 13, 14, 15 and 18 is therefore not novel.

- 2.3 D1 furthermore discloses a process for hydrogenating a hydrocarbon resin using the catalyst, thereby anticipating claim 19 and rendering obvious claim 26.

**3. DOCUMENT D2**

- 3.1 D2 (examples 5, 6) discloses a hydrogenation catalyst comprising Ni, Al, Mg and Si obtained by co-precipitation. The catalyst has the following composition:

62,9 g nickel nitrate hydrate (M=290,7 g/mol) ~ 0,216 mol Ni,

15,6 aluminium nitrate hydrate (M=375 g/mol) ~ 0,042 mol Al,

1,7 g magnesium nitrate hydrate (M=256, g/mol) ~ 0,007 mol Mg and

10,0 g sodium silicate (M=284 g/mol) ~ 0,035 mol Si.

D2 does not disclose the specific Ni:Al atomic ratio but teaches that alumina:silica weight ratios of 0,45:1-1:0,45 are suitable (claim 1 of D2), thereby guiding the skilled person to vary the respective amounts.

D2 furthermore discloses the passivation of the catalyst (col. 6, lines 3-16). The surface oxide coating represents a protective coating which prevents (further)

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oxidation of the catalyst.

Since it is not derivable from the present application that any effect related to the selection of a specific Ni:Al atomic ratio may be obtained, no inventive step is present in claim 2.

3.2 Similar considerations apply in view of independent claims 13, 14, 15, 18, 19 and 26.

**4. DOCUMENT D3**

- 4.1 D3 discloses a catalyst for hydrogenating oils and fats (col. 3, lines 48-54). The catalysts comprise Ni, Al and Si with atomic ratios falling within the ranges of claim 1 (cf. table I). D3 furthermore lists Mg as a suitable promoter (col. 3, lines 35-40) and indicates an amount of 0,5-10 wt% calculated on the weight of nickel, i.e. for 1 g Ni=0,017 mol from 0,005 g Mg=0,0002 mol to 0,10 g Mg=0,004 mol. This corresponds to an atomic ratio of Ni:Mg within the range of about 4-85. D3 does not disclose the presence of a protective coating.
- 4.2 However, it is common to apply a protective layer to nickel-based hydrogenation catalysts, see item 7 (D6 and D7).

**5. DOCUMENT D4**

- 5.1 D4 also relates to catalysts for hydrogenating fats and oils (col. 4, lines 18-20). D4 describes a catalyst containing Ni, Mg and SiO<sub>2</sub> (col. 2, lines 47-61; table 1). The Ni:Si atomic ratio is 4,3-3,4. The Ni:Mg atomic ratio is 9. The catalyst may contain alumina in addition to the silica (col. 4, lines 17). D4 furthermore teaches that the catalyst may be dispersed in fat in order to obtain a commercial product (col. 1, lines 13-18).

In the absence of any technical effect related to the selection of a specific Ni:Al ratio, the subject-matter of at least independent claims 2, 13, 19 and 26 also lacks an inventive step in view of D4.

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**6. DOCUMENT D5**

A catalyst comprising nickel, alumina, silica and magnesium (contained in the clay, the composition of which is indicated on page 3, lines 20-44) for hydrogenating fatty materials is furthermore known from D5 (examples 1, 2). The catalyst is stabilised using CO<sub>2</sub>. In the absence of any effect related to the selection of specific atomic ratios, D5 renders obvious at least claim 2.

**7. DOCUMENTS D6, D7**

- 7.1 D6 and D7 relate to the application of a fat-based protective coating to nickel catalysts. D4 also states that the catalyst may be stabilised in fat (col. 1, lines 13-18). Furthermore, commercial nickel-based hydrogenation catalysts are provided with a fat-based protective coating.

It does not appear to require any inventive activity to apply this standard method to other specific nickel containing hydrogenation catalysts, such as those known from D1-D5.

Hence, the feature relating to the protective coating does not support an inventive step.

**8. DEPENDENT CLAIMS**

- 8.1 Dependent claims 3-12 and 16-17, 20 do not appear to contain any additional features which might establish novelty and/ or inventive. Specifically, the catalyst of D1 is considered to inherently exhibit nickel crystallites / a nickel surface area / a BET surface area as defined in claims 5, 11 and 12 because it has been obtained by a very similar process of preparation.